CLAIMS

1. A pulse detonation engine system for driving a turbine, comprising:

a detonation generator section including a detonation tube having a tabular hollow section for permitting a detonation to be generated therein during combustion process of a mixture gas combined with a gas and a fuel, a gas supply section for feeding the gas into the tubular hollow section of the detonation tube at given time intervals, a fuel supply section for feeding the fuel into the tubular hollow section of the detonation tube at the given time intervals, and an igniter for igniting the mixture gas in the tubular hollow section of the detonation tube; and

a pulse detonation driven turbine driven by impact energies of detonations that intermittently generated in the tubular hollow section of the detonation tube.

2. The pulse detonation engine system for driving the turbine according to claim 1, wherein

the detonation generator section further includes a shock alleviating section that alleviates the impact energies of the detonations for protecting the pulse detonation driven turbine from directly receiving the impact energies of the detonations.

3. The pulse detonation engine system for driving the turbine according to claim 1, wherein

the shock alleviating section includes a shock damper for converting the impact energies of the detonation waves, released from an open end of the detonation tube, into compression energies of the gas, and the compression energies of the gas is introduced into the pulse detonation driven turbine.

4. The pulse detonation engine system for driving the turbine according to claim 3,

wherein

the shock damper includes a bypass flow passage for permitting the gas to flow for continuously operating the pulse detonation driven turbine.

5. The pulse detonation engine system for driving the turbine according to claim 1, wherein

the pulse detonation driven turbine includes first and second turbines disposed on a common rotor shaft in opposition to each other to allow the impact energies of the detonations to be dispersed onto the first and second turbines whereby the first and second turbines are driven while permitting forces, applied to the first and second turbines in an axial direction, to cancel each other.

6. The pulse detonation engine system for driving the turbine according to claim 1, further comprising:

a reformer for reforming a first fuel into a second fuel, wherein

the fuel to be supplied to the fuel supply section of the detonation tube includes the second fuel that is reformed.

7. The pulse detonation engine system for driving the turbine according to claim 6, wherein

the first fuel includes hydrocarbon fuel comprised of natural gas, LPG and petroleum, alcohol fuel or dimethyl ether, and the reformer reforms the first fuel into the second fuel containing hydrogen and carbon monoxide.

8. The pulse detonation engine system for driving the turbine according to claim 6, wherein

the second fuel that is reformed contains hydrogen at a ratio of 30 % and more.

9. The pulse detonation engine system for driving the turbine according to claim 6, wherein

the reformer is introduced with waste heat recovered from the pulse detonation driven turbine for achieving reforming.

10. The pulse detonation engine system for driving the turbine according to claim 1, wherein

after a hot flow process, with a high temperature, resulting from the detonation, the gas supply section is operative to permit a cold flow process that combines purging combustion gases from the detonation tube and cooling at least one of the tubular hollow section of the detonation tube and the pulse detonation driven turbine by supplying the detonation tube with a gas in excess of a given flow rate, to be generated, and is operative to alternately execute the hot flow process and the cold flow process.

11. The pulse detonation engine system for driving the turbine according to claim 1, wherein

the pulse detonation driven turbine is pre-cooled with steam generated by a waste heat recovery boiler.

12. The pulse detonation engine system for driving the turbine according to claim 1, further comprising:

an electric power generator for converting a drive force generated by the turbine into electric power.

13. The pulse detonation engine system for driving the turbine according to claim 1,

further comprising:

a shaft member rotated by motive power converted from drive force generated by the turbine.

14. A method of driving a turbine using a pulse detonation engine system, the method comprising:

feeding a gas into a tabular hollow section of a detonation tube at given time intervals;

feeding a fuel into the tubular hollow section of the detonation tube at the given time intervals;

igniting a mixture gas combined with the gas and the fuel in the tubular hollow section of the detonation tube;

permitting a detonation to be generated in the tubular hollow section of the detonation tube; and

driving the turbine by introducing impact energies of detonations, intermittently generated in the tubular hollow section of the detonation tube, into the turbine.

15. The method of driving the turbine according to claim 14, further comprising:

alleviating the impact energies of the detonations for protecting the turbine from directly receiving the impact energies of the detonations.

16. The method of driving the turbine according to claim 15, wherein

the step of alleviating the impact energy comprises converting the impact energies of the detonations released from an open end portion of the detonation tube into compression energy of the gas, and introducing the converted compression energy of the gas into the turbine.

17. The method of driving the turbine according to claim 15, wherein

the step of alleviating the impact energy comprises flowing the gas for continuously operating the turbine.

18. The method of driving the turbine according to claim 14, wherein the turbine comprises first and second turbines, and wherein

the step of driving the turbine comprises dispersing energy released from the detonation into the first and second turbines, and driving the first and second turbines while permitting forces applied thereto in an axial direction to cancel each other.

19. The method of driving the turbine according to claim 14, wherein

the step of supplying the fuel comprises reforming a first fuel into a second fuel, and supplying the second fuel into the tubular hollow section of the detonation tube at the given time intervals.

20. The method of driving the turbine according to claim 19, wherein

the first fuel includes hydrocarbon fuel comprised of natural gas, LPG and petroleum, alcohol fuel or dimethyl ether, and the step of reforming the first fuel comprises reforming the first fuel into the second fuel containing hydrogen and carbon monoxide.

21. The method of driving the turbine according to claim 19, wherein

the step of reforming the first fuel performs reforming such that the resulting second fuel contains hydrogen at a ratio of 30 % and more.

22. The method of driving the turbine according to claim 14, further comprising:

achieving a hot flow process with a high temperature as a result of the detonation;

achieving a cold flow process concurrently executing to purge combustion gases from the tubular hollow section of the detonation tube and to cool at least one of the tubular hollow section of the detonation tube and the turbine by supplying a stream of the gas, in excess of a given flow rate, into the detonation tube; and

alternately and repeatedly executing the steps of achieving the hot flow process and the cold flow process.

23. The method of driving the turbine according to claim 14, further comprising:

pre-cooling the turbine with steam delivered from a waste heat recovery boiler.

24. The method of driving the turbine according to claim 14, further comprising:

generating electric power by converting drive force, resulting from the turbine, into electric power.

25. The method of driving the turbine according to claim 14, further comprising:

converting drive force resulting from the turbine into motive power and transferring the motive power to a power shaft.